CLAIMS

[Claim(s)]
[Claim 1] The supporter which is test equipment which conducts electrical-characteristics inspection of two or more image sensors arranged on the front face of a transparence substrate, and holds the above-mentioned transparence substrate, The reversal device which is made to reverse this supporter and turns the rear face of the above-mentioned transparence substrate upward, Test equipment characterized by having the light source which irradiates light to the rear face of the above-mentioned transparence substrate reversed through this reversal device, and an inspection means to inspect the electrical characteristics of the above-mentioned image sensor in the condition that light is irradiated from this light source.
[Claim 2] Test equipment according to claim 1 characterized by having the conveyance device in which the above-mentioned transparence substrate is conveyed.
[Claim 3] Test equipment according to claim 1 or 2 characterized by having the migration device in which the above-mentioned supporter and the above-mentioned reversal device are moved to X, Y, and a Z direction at least.
[Claim 4] The above-mentioned supporter is test equipment given in any 1 term of claim 1 characterized by having the supporter which holds the above-mentioned transparence substrate on the periphery - claim 3.
[Claim 5] The above-mentioned supporter is test equipment according to claim 4 characterized by having the flueway which carries out opening by two or more places of the above-mentioned supporter.
[Claim 6] The above-mentioned supporter is test equipment given in any 1 term of claim 2 characterized by having the penetration section into which the arm of the above-mentioned conveyance device advances - claim 5.
[Claim 7] The above-mentioned inspection means is test equipment given in any 1 term of claim 1 characterized by having the heating unit which heats an image sensor - claim 6.
[Claim 8] The above-mentioned light source is test equipment given in any 1 term of claim 1 characterized by being arranged above the above-mentioned supporter - claim 7.
[Claim 9] The above-mentioned inspection means is test equipment given in any 1 term of claim 1 characterized by being arranged under the above-mentioned supporter - claim 8.
[Claim 10] The process which is the inspection approach of conducting electrical-characteristics inspection of two or more image sensors arranged on the front face of a transparence substrate, and conveys the above-mentioned transparence substrate, The process which holds the above-mentioned transparence substrate by the supporter, and the process which reverses the above-mentioned supporter in order to turn the rear face of the above-mentioned transparence substrate upward, The inspection approach characterized by equipping the rear face of the above-mentioned transparence substrate with the process which irradiates light, and the process which inspects the electrical characteristics of the above-mentioned image sensor in the condition that the above-mentioned light is irradiated.

[Translation done.]

* NOTICES *

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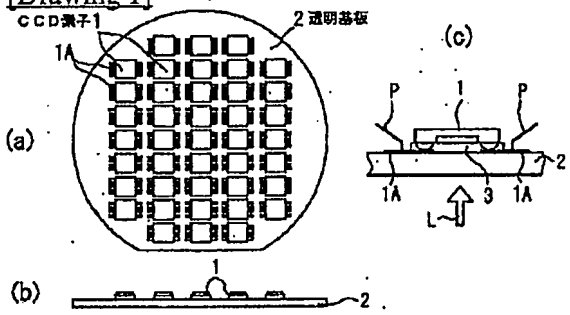
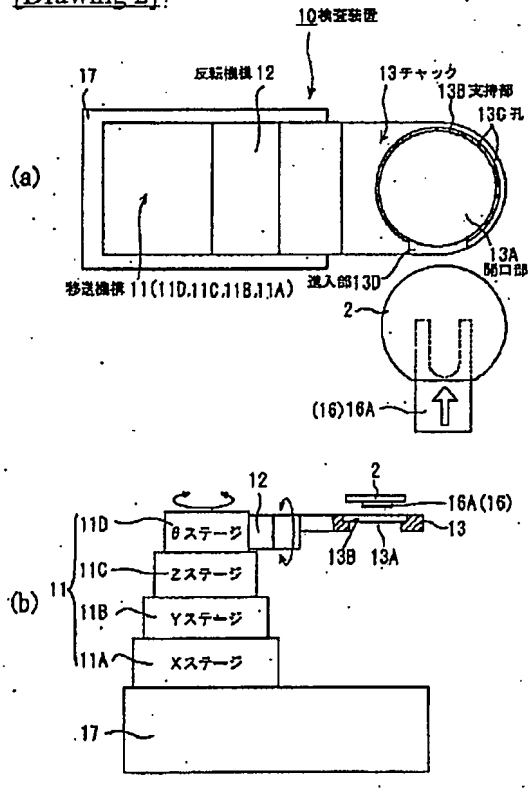
DRAWINGS

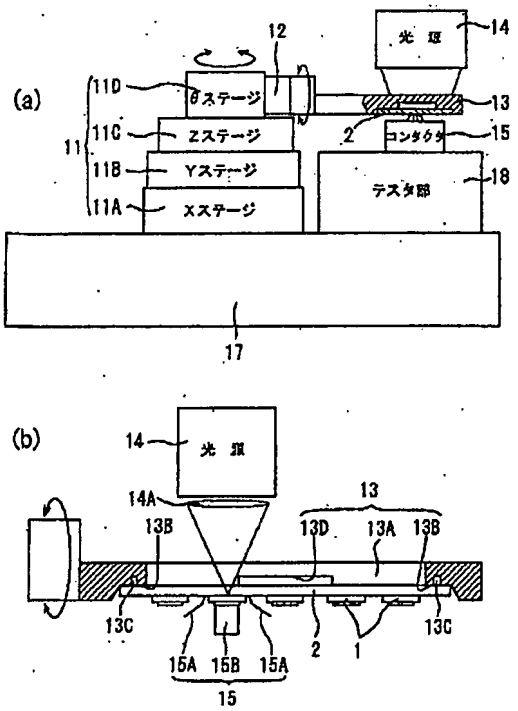
[Drawing 1]



[Drawing 2]



[Drawing 3]



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the test equipment which can conduct automatically electrical-characteristics inspection of an image sensor (for example, CCD component) in more detail about test equipment and the inspection approach.
[0002]
[Description of the Prior Art] Since there is very much the need, semiconductor integrated circuits, such as a memory circuit component and a logic circuit element, are produced in large quantities. And electrical-characteristics inspection of a semiconductor integrated circuit is conducted using various test equipment, and the defective article is screened. Moreover, in order to also cross the contents of inspection variably to a lot of [inspection quantity] tops, automation is performed as much as possible like [test equipment] other semiconductor fabrication machines and equipment.
[0003] Moreover, recently, the spread of the CCD components used as an image sensor is also remarkable, and the need is also extended by leaps and bounds. However, the test equipment of a CCD component is behind in automation, if it compares with semiconductor integrated circuits, such as a memory circuit component.
[0004] This invention was made in order to solve the above-mentioned technical problem, and it aims at offering the test equipment and the inspection approach of conducting automatically electrical-characteristics inspection of image sensors, such as a CCD component.
[0005]
[Means for Solving the Problem] The supporter which the test equipment of this invention according to claim 1 is test equipment which conducts electrical-characteristics inspection of two or more image sensors arranged on the front face of a transparence substrate, and holds the above-mentioned transparence substrate, The reversal device which is made to reverse this supporter and turns the rear face of the above-mentioned transparence substrate upward, It is characterized by having the light source which irradiates light to the rear face of the above-mentioned transparence substrate reversed through this reversal device, and an inspection means to inspect the electrical characteristics of the above-mentioned image sensor in the condition that light is irradiated from this light source.
[0006] Moreover, the test equipment of this invention according to claim 2 is characterized by having the conveyance device in which the above-mentioned transparence substrate is conveyed in invention according to claim 1.
[0007] Moreover, the test equipment of this invention according to claim 3 is characterized by having the migration device in which the above-mentioned supporter and the above-mentioned reversal device are moved to X, Y, and a Z direction at least in invention according to claim 1 or 2.
[0008] Moreover, as for the above-mentioned supporter, the test equipment of this invention according to claim 4 is characterized by having the supporter which holds the above-mentioned transparence substrate on the periphery in invention given in any 1 term of claim 1 - claim 3.
[0009] Moreover, it is characterized by the test equipment of this invention according to claim 5 having the flueway which carries out opening of the above-mentioned supporter by two or more places of the above-mentioned supporter in invention according to claim 4.
[0010] Moreover, as for the above-mentioned supporter, the test equipment of this invention according to claim 6 is characterized by having the penetration section into which the arm of the

above-mentioned conveyance device advances in invention given in any 1 term of claim 2 - claim 5.
[0011] Moreover, as for the above-mentioned inspection means, the test equipment of this invention according to claim 7 is characterized by having the heating unit which heats an image sensor in invention given in any 1 term of claim 1 - claim 6.
[0012] Moreover, the test equipment of this invention according to claim 8 is characterized by arranging the above-mentioned light source above the above-mentioned supporter in invention given in any 1 term of claim 1 - claim 7.
[0013] Moreover, the test equipment of this invention according to claim 9 is characterized by arranging the above-mentioned inspection means under the above-mentioned supporter in invention given in any 1 term of claim 1 - claim 8.
[0014] Moreover, the inspection approach of this invention according to claim 10 The process which is the inspection approach of conducting electrical-characteristics inspection of two or more image sensors arranged on the front face of a transparence substrate, and conveys the above-mentioned transparence substrate, The process which holds the above-mentioned transparence substrate by the supporter, and the process which reverses the above-mentioned supporter in order to turn the rear face of the above-mentioned transparence substrate upward, It is characterized by equipping the rear face of the above-mentioned transparence substrate with the process which irradiates light, and the process which inspects the electrical characteristics of the above-mentioned image sensor in the condition that the above-mentioned light is irradiated.
[0015]
[Embodiment of the Invention] Hereafter, this invention is explained based on the operation gestalt shown in drawing 1 - drawing 3 . First, the principle of electrical-characteristics inspection of the CCD component as an image sensor is explained based on drawing 1 . The CCD component 1 is arranged in the shape of a matrix in all directions on the front face of the transparence substrates 2, such as quartz glass, as shown in (a) of drawing 1 , and (b). And on the transparence substrate 2, two or more electrode 1A corresponding to each CCD component 1 is formed, and as shown in (c) of this drawing, each CCD component 1 is connected to two or more electrode 1A through bump 1B. Moreover, it filled up with under-filling 3 between the CCD component 1 and the transparence substrate 2, and the CCD component 1, electrode 1A, and the transparence substrate 2 of each other are stuck through under-filling 3. And in conducting electrical-characteristics inspection of the CCD component 1, it irradiates Light L from the rear-face side of the transparence substrate 2 at the CCD component 1. The electrical signal by which photo electric conversion was carried out in the optoelectric transducer (not shown) of the CCD component 1 is detected through contact (probe) P which contacted each electrode 1A electrically, and electrical-characteristics inspection of the CCD component 1 is conducted by the circuit tester which is not illustrated.
[0016] As it ** and the test equipment 10 of this operation gestalt is shown in (a) of drawing 2 , (b), and (a) of drawing 3 and (b) The migration device 11 movable in X, Y, Z, and the direction of theta, and the reversal device 12 attached in this migration device 11, The supporter 13 which is connected with this reversal device 12 possible [forward inverse rotation], and carries out adsorption maintenance of the transparence substrate 1 (chuck), The light source 14 (refer to drawing 3) which irradiates light from that opening 13A at the rear face of the transparence substrate 2 held by this chuck 13, It has the contactor 15 (refer to drawing 3) which has two or more probe 15A which detects the electrical signal generated in the CCD component 1 based on the exposure light of this light source 14 through two or more electrode 1A, and electrical-characteristics inspection of two or more CCD components 1 (refer to drawing 1) on the transparence substrate 2 is conducted automatically. Moreover, test equipment 10 is equipped with the conveyance device 16, and delivers the transparence substrate 2 between a cassette (not shown) and a chuck 13 through arm 16A.
[0017] X stage 11A which is arranged on a pedestal 17 and moves in the direction of X as the migration device 11 is shown in (a) of drawing 2 , and (b), Y stage 11B which is arranged on this X stage 11A, and moves in the direction of Y, Z stage 11C which is arranged on this Y stage 11B, and goes up and down to a Z direction, It is arranged on this Z stage 11C, and has inverse rotation [forward] theta stage 11D centering on vertical axes. When inspecting each CCD component 1 of the transparence substrate 2 like the after-mentioned, while carrying out indexing of the transparence substrate 2 held by the chuck 13 through X and the Y stages 11A and 11B in the direction of X, and

the direction of Y Disjunction of the probe 15A is carried out to the CCD component 1 through Z stage 11C in an inspection location.

[0018] A chuck 13 is reversed through the reversal device 12 with which theta stage 11D was equipped. That is, when delivering the transparence substrate 2, the field which supports the transparence substrate 2 turns into a top face, when inspecting the CCD component 1 of the transparence substrate 2, it is reversed, and the field which supports the transparence substrate 2 turns into an inferior surface of tongue. Opening 13A of this chuck 13 is formed in the tip side of a chuck 13 according to the configuration and magnitude of the transparence substrate 2, and that tip side is formed in the shape of a frame. Moreover, a step is formed in the top face of a chuck 13 as supporter 13B over the opening 13A perimeter, and the periphery edge of the transparence substrate 2 is supported by this supporter 13B. In this chuck 13, the exhaust air way which is open for free passage to evacuation equipment (not shown) is formed, and this exhaust air way is carrying out opening of the hoop direction regular intervals of supporter 13B as hole 13C for adsorption in empty beam two or more parts. Therefore, with the evacuation by evacuation equipment, the transparence substrate 2 is vacuum-adsorbed on supporter 13B, and it fixes. Moreover, penetration section 13D into which arm 16A of the conveyance device 16 advances is formed in a chuck 13 according to the width of face of arm 16A, as an arrow head A shows, arm 16A holding the transparence substrate 2 advances into (a) of drawing 2 right above a chuck 13, a chuck 13 goes up to a Z direction, and arm 16A fits in in penetration section 13D, and hands over the transparence substrate 2 to supporter 13B.

[0019] Moreover, as shown in (a) of drawing 3 , and (b), predetermined spacing was vacated mutually, it has been arranged and the light source 14 was located in the bottom, the contactor 15 was located in the bottom and the light source 14 and a contactor 15 have countered it mutually. As the light source 14 is shown in (b) of drawing 3 , it has condenser lens 14A which counters the downward contactor 15, and dust, such as particle, adheres to condenser lens 14A. And these both 14 and the chuck 13 which placed the front face of the transparence substrate 2 upside down among 15 repeat indexing and rise and fall through the migration device 11, and the CCD component 1 is inspected.

[0020] The contactor 15 is being fixed on the pedestal 19 through the circuit tester section 18, as shown in (a) of drawing 3 , and (b). The light source 14 vacates predetermined spacing, and is fixed above this contactor 15, and the chuck 13 is movable between the light source 14 and a contactor 15 at X, Y, and a Z direction. A contactor 15 Moreover, for example, two or more probe 15A arranged by two trains corresponding to electrode 1A of the CCD component 1 as shown in this drawing, It has heating unit 15B which is arranged among probe 15A of two trains, and heats the CCD component 1, and while two or more probe 15A contacts electrically each electrode 1A of the CCD component 1, respectively at the time of inspection, heating unit 15B contacts the CCD component 1.

[0021] Next, actuation is explained. First, if the transparence substrate 2 is picked out from a cassette (not shown) through arm 16A of the conveyance device 16 in the condition of having become upward as supporter 13B of a chuck 13 showed (a) of drawing 2 , and (b) and the transparence substrate 2 is conveyed to right above a chuck 13, while Z stage 11C will go up and handing over the transparence substrate 2 on supporter 13B, arm 16A fits in in penetration section 13D. Then, while evacuation equipment drives and carrying out vacuum adsorption of the transparence substrate 2 in supporter 13B, arm 16A retreats from a chuck 13.

[0022] Subsequently, a chuck 13 is reversed through the reversal device 12, the CCD component 1 on the transparence substrate 2 is turned downward, and the rear face of the transparence substrate 2 is turned upwards. Then, if it advances between the light source 14 and a contactor 15 as it moves in X and the direction of Y through X and the Y stages 11A and 11B and is shown in (a) of drawing 3 , after performing alignment of a contactor 15 and the CCD component 1 through the alignment device which is not illustrated, the first CCD component 1 is moved to the inspection location of a contactor 15 through X and the Y stages 11A and 11B. A chuck 13 descends to a Z direction through Z stage 11C in this location, and while probe 15A of a contactor 15 and electrode 1A of the CCD component 1 contact electrically, heating unit 15B contacts the CCD component 1. And while heating the CCD component 1 to predetermined temperature (for example, 50 degrees C) by heating unit 15B, light is irradiated from the light source 14.

[0023] With the CCD component 1, light is changed into an electrical signal through an optoelectric transducer, and an electrical signal is outputted through electrode 1A. In a contactor 15, after detecting an electrical signal through probe 15A, an electrical signal is analyzed in the circuit tester section 18, and electrical-characteristics inspection of the CCD component 1 is ended. After ending inspection of the first CCD component 1, a chuck 13 goes up through Z stage 11C, and contact of the CCD component 1 and probe 15A is canceled. Subsequently, after carrying out indexing of the CCD component 1 through X and the Y stages 11A and 11B, it descends through Z stage 11C, and as the CCD component 1, following probe 15A, and following heating unit 15B mentioned above, while contacting, after inspecting this CCD component 1 by the exposure light from the light source 14, a chuck 13 goes up through Z stage 11C. After ending inspection of all the CCD components 1 by indexing of X and the Y stages 11A and 11B, the transparence substrate 2 held by the chuck 13 retreats from the light source 14 and a contactor 15 through the migration device 11, and moves to the delivery location of the transparence substrate 2. The CCD component 1 after inspection is returned to the original location of a cassette through the conveyance device 16 in this location. Then, the new transparence substrate 2 is handed over by the chuck 13, and it inspects in the same way.

[0024] As explained above, according to this operation gestalt, X, Y, Z, and the migration device 11 movable in the direction of theta, The reversal device 12 with which theta stage 11D of this migration device 11 was equipped, The chuck 13 which is connected with this reversal device 12, and holds the transparence substrate 2, The light source 14 which irradiates light at the rear face of the transparence substrate 2 held by this chuck 13, Since it has the contactor 15 which has two or more probe 15A which detects the electrical signal generated in the CCD component 1 based on the exposure light of this light source 14 through two or more electrode 1A, Electrical-characteristics inspection can be automatically conducted about the CCD component 1 on the transparence substrate 2, carrying out indexing of the CCD component 1 for the transparence substrate 2 held by the chuck 13 through X of the migration device 11, and the Y stages 11A and 11B.

[0025] Moreover, since the conveyance device 16 in which the transparence substrate 2 was conveyed was established according to this operation gestalt, delivery of the transparence substrate 2 is automatable between a cassette and a chuck 13. Moreover, since a chuck 13 has supporter 13B which supports the transparence substrate 2 at the periphery edge, it can secure opening 13A at the time of irradiating light to the transparence substrate 2 from the light source 14. Moreover, since a chuck 13 has the flueway which carries out opening by two or more places of supporter 13B, it can carry out adsorption immobilization of the transparence substrate 2 certainly in supporter 13B. Furthermore, since a chuck 13 has penetration section 13D into which arm 16A of the conveyance device 16 advances, it can deliver the transparence substrate 2 smoothly between arm 16A and a chuck 13. Moreover, since a contactor 15 has heating unit 15B which heats the CCD component 1, it can be inspected, heating the CCD component 1. Moreover, the light source 14 is arranged above a chuck 13, the light source 14 is written downward, and dust, such as particle, does not adhere to the light source 14.

[0026] In addition, this invention is not restricted to the above-mentioned operation gestalt at all. This invention is applicable, although the CCD component was mentioned as the example and the above-mentioned operation gestalt explained it as an image sensor, the image sensors, for example, the MOS mold component, other than a CCD component.

[0027]

[Effect of the Invention] According to invention of this invention according to claim 1 to 10, the test equipment and the inspection approach of conducting automatically electrical-characteristics inspection of image sensors, such as a CCD component, can be offered, without making dust, such as particle, adhere to the light source.

[Translation done.]